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THE

TRIUMPH OF AMERICAN MEDICINE IN THE CONSTRUCTION OF THE PANAMA CANAL

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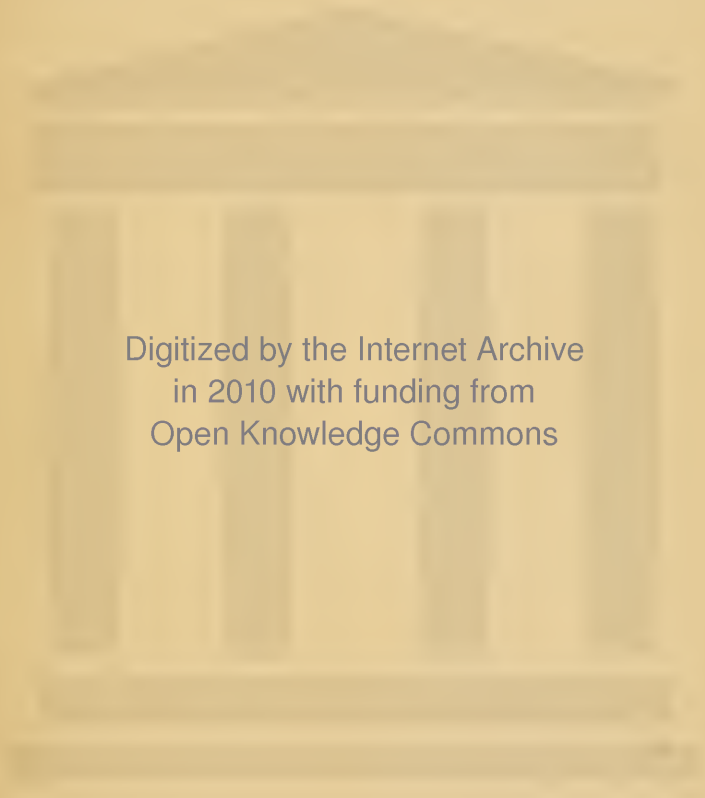
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THE MALARIAL MOSQUITO (FEMALE) IN STINGING POSITION.

The mosquito acts as an intermediary host, carrying the infection in the fluids of its body, and introducing it into the blood of the human subject through wounds made by its bite. (From the model at the American Museum of Natural History, New York.)

THE TRIUMPH

OF

AMERICAN MEDICINE

IN THE

Construction of the Panama Canal

BY

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WITH GRATEFUL APPRECIATION THIS LITTLE BOOK IS DEDICATED
TO THE LADY OF THE OPEN ARMS INN

Ich komme vom Gebirge her,
Es dampft das Thal, es braust das Meer—
Ich wandre still, bin wenig froh,
Und immer frägt die Fremde wo.

INTRODUCTION

In his great work—the reclamation of the pestilence breeding neck of land which binds together the two portions of our Continent—Colonel W. C. Gorgas, U. S. A., Chief Sanitary Officer, Isthmian Canal Commission, has contributed another and a most important chapter to the growing volume of sanitary science. He has demonstrated beyond question the efficiency of an organized system of sanitation, in a field presenting all of the difficulties and all of the destructive influences which characterize territorial areas in the tropics. He has shown that, despite the normal conditions of perverted states of health, the offspring of soil and climatic conditions, these lands of our globe may be so purged of disease and purified by systems of sanitation that they will assume in all respects the states of health belonging to a temperate clime. His work marks an epoch in the progress of the world, and teaches a lesson that "he who runs may read." It inculcates in forceful manner the important place instruction in sanitary science should have in all institutions devoted to the education of the growing race, beginning in elementary form in the schools of the young and carried to the most advanced degree in our colleges, so that the simple yet great principles of hygiene should be a part of the knowledge of every citizen whose civic obligations and duties make him a factor in the prevention of disease and in the conservation of the public health.

THE TRIUMPH OF AMERICAN MEDICINE IN THE CONSTRUCTION OF THE PANAMA CANAL

In a paper published in the volume of Transactions of the American Surgical Association for 1908, entitled "Modern Medicine and Surgery in the Orient," I discussed the subject of the conservation of the public health, and directed attention to the methods of sanitation practised in the countries of the Orient, as I had observed them in a visit which I had recently made to these countries. In concluding the paper, I spoke of what had been accomplished in our country, and referred to the great work done in the Isthmian Canal Zone by Col. W. C. Gorgas, U. S. A., Chief Sanitary Officer, Isthmian Canal Commission, and stated that his achievements had made the construction of the Canal possible, claiming that its completion would be a triumph of American Medicine.

During the past winter I visited the Canal Zone and had, through the courtesy of Col. Gorgas, an opportunity to observe the marvellous results obtained in the conservation of the health, by the methods of sanitation employed, of the large army of officials and work people, some 47,000 in number, engaged in the stupendous undertaking of the Canal construction.

In order to fully appreciate what has been accomplished by the system of sanitation inaugurated by Col. Gorgas and so perfectly

conducted by him and his able corps of assistants, it is necessary to consider the conditions of health which, up to the beginning of the work of the Americans, prevailed in the cities of Colon and Panama, and in what is now known as the Canal Zone, ten miles of territory acquired by purchase by the United States Government from the Republic of Panama, and which is located five miles on either side of the Canal route, including an area of three hundred and twenty-two square miles.

For nearly four hundred years that portion of the neck of land between the Continents of North and South America, now called the Isthmus of Panama, has been known to be one of the unhealthiest regions of the Globe. Uninhabitable to any but the few natives who made their homes there, and the residents of the cities of Panama and Chagres, at the mouth of the Chagres River, on the Atlantic Ocean, with their blood charged to the full with malarial parasites, who fell in great numbers victims to the deadly scourges of malarial and yellow fever, known in their most pernicious forms as Chagres fever, which, existing as endemic forms, frequently assumed the proportions of devastating epidemics, developing under the climatic conditions which encouraged the facile breeding of the anopheles mosquitoes, and the absence of any quarantine regulations which controlled the influx of the stegomyia species, or of its work in transmitting infection.

The eager quest of gold in the waters and lands of California brought many white people to the Isthmus in the year 1849, who desired in this way to avoid the longer and much delayed route around Cape Horn. On foot, on mule, and in vehicles of varied design they fought their way through the almost impenetrable jungle, in torrid heat, under blistering sun-rays, and in torrential rains. Overcome by climatic conditions and exhausted by fatigue, they fell easy victims to the fierce onslaught of the native

anopheles, which in swarming myriads welcomed the invasion of new blood. Many laid down to die to find an uninviting grave in the desolate morass and in the tangled jungle.

The tide of travel across the Isthmus increased to such extent as to encourage the building of a railroad from the Atlantic to the Pacific Ocean. This was undertaken in 1849 and completed in 1855, under very great difficulties in railway construction, owing to the conditions of land and soil. Here again the anopheles and stegomyia played havoc in the ranks of the laborers, and so many perished from disease that it became a common saying that every railroad tie represented the dead body of a workman.

Ignorant of the cause of malarial and yellow fevers and their methods of transmission, the medical officers in charge were forced to content themselves simply in combating the developed disease with antimalarial remedies and those commonly employed in treating yellow fever.

In the year 1881 another invasion of the Isthmus took place, when the original French Company began the construction of an Isthmian Canal. Eleven years—1881 to 1892—were consumed in construction work before the effort was abandoned, with very little accomplished comparatively in the way of a completed canal. While it is stated that corrupt methods and graft played an important part in producing the failure, it is believed that diseases, now preventable, were chiefly responsible. The fifty buildings devoted to hospital purposes left by the French bear testimony to the fact that the medical department was fully organized, but its work was largely ineffective, because the state of knowledge then existing was defective in producing information as to the prevention of the diseases the medical officers were called upon to combat.

That heroic son of Medicine, Dr. Lazear, U. S. A., had not given his life to demonstrate that the infection of yellow fever

was transmitted by the mosquito, Stegomyia fasciata, and Col. Gorgas, U. S. A. had not driven disease and pestilence out of Havana by the enlightened methods of sanitation devised by him. The hopeless contest waged against disease by the French is illustrated in the statement made by Capt. Constant Cordier, U. S. A., in the thesis presented by him to the San Marcos University, Lima, Peru, for the degree of Doctor of Philosophy, to the effect that in five years the French lost eleven-sixteenths of the working force, one-third of the number French subjects. Out of the twenty-four Sisters of Charity engaged in nursing in the Ancon Hospital, twenty died of yellow fever. Of seventeen engineers who came on one steamer, sixteen died. During the period of time in which the Panama Railroad was undergoing construction, and in the eleven years in which the French were engaged in their efforts to construct the Canal, the losses by death from malarial and yellow fever were as great as any suffered by the white race in the history of the tropics.

In the year 1904, when the United States Government took charge of the Canal Zone and began the Canal construction, Col. Gorgas, fresh from the victories won by him in Cuba, was assigned to duty as the Chief Sanitary Officer in the Zone, and began the colossal work of transforming a territorial area of three hundred and twenty-two square miles, surcharged with disease-producing causes, into a region so free from disease that the mortality among the officials and working people is now not greater than that of the towns and cities of our country.

This standard of health was regarded as essential, in order (1) to attract and to protect skilled white workmen who came from their homes in our country, and (2) to maintain a condition of health among all classes of the working force which would contribute to the continuous and successful labor which was necessary in accomplishing the Canal construction. Col. Gorgas was not

Old yellow fever ward at Ancon Hospital.

only charged with the duty of converting the intricate recesses of the jungle into healthful homes for the employees, but also he was confronted with the difficult task of renovating two cities, aggregating in population fifty thousand people, one of which had been for quite two and a half centuries the birthplace and the home of pestilence and disease. Such were the conditions which existed within the Canal Zone which demanded treatment. At either end of the Zone were gates which, unless securely closed against the introduction of infective diseases, would prove to be fertile sources of conditions which would render futile the efforts made to establish correct sanitary methods within the Zone. These were the harbors of Colon, on the Atlantic Ocean, and Panama, on the Pacific Ocean.

Into these harbors came the trade of the World, in vessels from the Eastern and Western Hemispheres. On the Atlantic side the islands of the Antilles and the many ports of the eastern coast of Central and South America had free intercourse with the Zone through the Colon harbor. In many of the ports yellow fever existed in endemic form. History records that for over one hundred and fifty years yellow fever had existed in Havana, Cuba, as an endemic disease. On the west coast of South America similar conditions existed, many ports not only giving residence to the infective fevers but also to the plague.

In Guayaquil, Ecuador, it is stated that the inhabitants are inclined to rejoice in the presence of yellow fever, as this condition of health keeps out the foreigners who would invade the country and rob them of their business opportunities.

In many of the Pacific seaports the plague has a footing, and during my visit to some of them deaths occurred from it; the same may be said of the Atlantic ports. It is thus to be seen that not only was the Zone area to be purified and purged of disease causes, but it was to be protected from the invasion of disease

through the gates of commerce at each end. These conditions, within and without, confronted Col. Gorgas in the organization of his sanitary system, and enhanced greatly the difficulties to be overcome in perfecting it. Two chief propositions present themselves in the study of the sanitary system which was planned and adopted. The first one may be regarded as of major importance—that of the prevention of disease by the removal of causes—and the second, the guardianship of the well and the care of the sick from all causes and of those sustaining injuries in the work of canal construction.

The general state of health in the community of officials and work people is maintained by rigid inspection of all food issued for consumption, and by weekly examinations and analyses of the water supply from all sources, municipal water supplies, streams, and springs, and condensed water. The houses in which officials and work people live claim special attention, and equally well those of the inhabitants of Colon and Panama City. While the political government of these cities, which are within the limits of the Canal Zone, rests with the governmental authorities of the Republic, the sanitary and police control are supervised by the officers of the Canal Commission under the authority of the United States Government. This is absolutely necessary for the maintenance of public order and of correct sanitary conditions within the Zone. The plans for the construction of new houses must be submitted for approval to the health officers of these cities, and the buildings within the Zone for the employees are constructed under the same exacting conditions. Owing to the presence of the Plague on both coasts of Central and South America, it is especially necessary that new houses should be constructed so as to make them rat-proof and prevent the harboring of rats. These conditions are accomplished by either raising them three feet from the ground on supports of concrete or other

Oiled concrete drainage ditch near Ancon.

Typical malarial mosquito (Anopheles) breeding pool near dump

material, covered with tin, so that the rats cannot secure a footing on them, or if placed on the ground they must rest on a floor of concrete. All buildings are submitted to inspection at regular intervals; those not in a sanitary condition in the cities must be placed in that condition, if possible, by the owner, or they are condemned and destroyed. Disinfection and fumigation are practised in all buildings in which cases of infectious diseases have occurred. Permits to repair buildings and to occupy them temporarily or permanently must be obtained from the health officials.

In the cities of Panama and Colon systems of sewerage have been installed, and all buildings must make connections with the sewers. This condition exists in all of the communities in which residential or hospital buildings are located. Outside of the sewered areas in the native villages pit closets are used, and are disinfected weekly with a solution of larvacide, a very effective and cheap preparation, consisting of crude carbolic acid, resin, and caustic soda.

Uncompromising warfare is carried on against the mosquito, anopheles and stegomyia. In the cities and in the regions of the Zone occupied by officers or laborers all breeding places are either destroyed or kept in a sanitary condition, free from larvæ, by oiling or the use of larvacide. Stagnant pools and collections of water are filled up or in large areas drained by ditches which are maintained in sanitary condition. Special attention is given to defective roof gutters, which become prolific breeding places in the water which remains in them owing to the want of proper inclination to carry off all water which comes into them in a rainfall. When very defective by reason of sagging, they are removed, and the owners of buildings are required to replace those thus disposed of by new gutters. In some instances simple punching of the sagging portion keeps the gutter empty.

At first, considerable opposition was met with, and the Governor

of the District was requested to amend the decree giving authority to the health officials, so that this important work could not be interfered with. All receptacles containing water for use are required to be screened. The constant inspection of known breeding places is maintained, and the mosquito brigade is on continuous and vigilant duty. Persistent search is made for suspected places, and the surveillance is never relaxed. Although no case of yellow fever has occurred on the Canal Zone since the year 1905, the search for the stegomyia and its destruction continues.

The fact that both the adult and larvæ of stegomyia species are transported by railroad trains exposes the Zone to dangers which require that the most exacting precautions should be taken; their escape from patients before entering quarantine is quite within the range of possibility and greatly increases the work of prevention. Fortunately their recognition is within scientific knowledge, and their detection is thus facilitated. All patients are transported to the hospitals on screened stretchers or in screened ambulances.

Notwithstanding the rigid system of prevention, through sanitary measures which have been established on the Zone, the community is still further protected from the invasion of the mosquito, the breeding places of which may happen to escape destruction, by a most perfect plan of house screening. Residences particularly are screened, the rustless wire (copper) being employed for this purpose. Not only are the doors and windows protected, but the porches, including first and second story, are securely enclosed. On first view, the appearance is novel, and quite suggestive of huge bird cages. The assured safety thus given dissipates any feeling that the inmates are unwilling occupants of the apparent houses of detention.

The known part taken by the fly, the common house fly, in transporting germs of diseases makes it a source of grave danger,

and provokes measures of protection against its existence. These measures consist in supplying all buildings of the Commission with range closets, water, and sewer connections. The pit closets in the native villages are, so far as possible, made fly-proof, and are disinfected weekly by a solution of larvacide to prevent fly-breeding. By this means of prevention the fly becomes a "rara avis" within the Zone limits, and is very much less in number than in the villages and towns of our country. During my stay I saw but one specimen, and the comfort and freedom from danger enjoyed in the homes by their absence is very great, and quite in contrast to the conditions caused by them in our homes, be it in the country or in the city.

The rat as the habitat in its hairy integument of the plague flea demands extermination. The annual report of the Department of Sanitation, of the Isthmian Canal Commission for 1909, gives the number of rats caught and killed in Panama City during the year as 17,004; in the city of Colon the number killed was 7284. In Panama City 672 dogs were poisoned, and in Colon 66. The report of the Board of Health Laboratory, included in the report of the Department of Sanitation, contains record of 24 examinations of rabies and suspects, and 11 cases of preventive treatment for hydrophobia were completed.

An interesting item relates to the existence of crab-holes along the shores. In Colon 7600 were oiled and 224,220 were worked. In Cristobel 43,200 were worked, and in Mount Hope 73,229. Grass and weeds afford a harbor for mosquitoes. In Panama City 1,961,395 square feet of weeds and grass were cut and removed. In Bocas del Toro 340 square yards were cut and burned. In Colon 460 acres of vegetation were removed. In Colon 1,319,514 water receptacles were treated, and in Bocas del Toro 554 were overturned—158 breeding places of the mosquito were found in barrels, tubs, etc., and destroyed.

The antimalarial crusade is carried into the houses and into the public eating places of the employees of the Canal Commission. On the tables are placed bottles of the tonic quinine solution which is taken with the meals. Blood examinations are made to determine the presence of the malarial parasite. The complete report of Col. Gorgas for the year 1909 states the issues of quinine for the year to have been 3,148,053 pounds avoirdupois, an average per month of 262,337 pounds, representing an issue of 66.74 pounds during the year for each of the 47,167 employees reported as being present and engaged in the Canal construction.

I have selected these few items from Col. Gorgas' report to illustrate, in brief, the character and magnitude of the work carried on to prevent sickness among the employees of the Isthmian Canal Commission, and to maintain a state of health conducive to the most successful results in conducting the constructive work on the Canal. As a test of the success of the sanitary work, it is interesting to consider, among other diseases, the hospital admissions and deaths from malaria in the years 1905 to 1909.

Hospital admissions per thousand of employees: 1905, 514; 1906, 821; 1908, 282; 1909, 215. In 1906, owing to exceptional rains, mosquitoes were bred in many places and in large numbers, and it seemed not quite possible to control their existence by the measures which, under ordinary conditions, proved to be so successful. In the same period of time the deaths from malaria were: 1905, 86; 1906, 233; 1908, 73; 1909, 52. The vital statistics for 1909, as given by Col. Gorgas in his report, show a marked improvement. In 1905 and 1906, with the number of employees 16,512 and 26,547 respectively, the death rate was 25.86 and 41.73. In 1908 and 1909, with the number of employees 43,891 and 47,167 respectively, the death rate was 13.01 and 10.64. In the year 1909 the annual death rate per thousand of 11,662 white employees was 6.43 from disease and 3.43 from violence; total, 9.86. Of

Water barrel made mosquito proof.

Americans, average number 8386, including employees and their families, the death rate per thousand was from disease, 4.05; from violence, 2.27; total, 6.32. A further statement of the death rate of the total population, including the cities of Colon and Panama, and the country between them, shows it to have been in 1905, 49.94, and in 1909, 18.19.

Assuredly nothing can be added to these clear and authentic statements to demonstrate the value of the system of sanitary work inaugurated by Col. Gorgas and so faithfully and successfully conducted by him and his corps of able assistants.

From the consideration of the measures taken to prevent disease it will be interesting to observe how the sick are cared for. For the entire sanitary work on the Zone and in the cities of Panama and Colon there is a personnel of 1244, the average number of employees at work during the year, distributed in the chief sanitary office, care of property, quarantine service, health officers, in hospitals, sanitarium, asylum for lepers, and dispensaries. There are four hospitals, including a leper asylum, and one sanitarium and nineteen dispensaries. There is a hospital for the insane, which is conducted for the Republic of Panama, which pays to the Commission for each patient, seventy-five cents per day. The Canal Zone Government pays thirty cents a day in the hospitals for patients, and outside patients, as members of the families of employees and others, pay the same. Altogether the paying patients from all sources in the Zone contribute in the year $98,081.72.

Ancon is the Zone town at the Panama end of the Canal and opposite to Panama City. Here is the office of the Chief Sanitary Officer and the Ancon Hospital, which is the largest. This was the site of the French Hospitals. Of the seventy-five buildings for hospital purposes, about fifty were built by the French, which were found by the Americans covered by the jungle. Twenty-five

of the buildings are occupied by the Staff. In the Ancon Hospital there are 900 beds for medical purposes, in 27 wards; 320 beds for surgical patients, in 10 wards; 5 wards for contagious and infectious diseases; 2 wards and six rooms for tuberculosis.

A maternity department is conducted for the families of white American employees, who pay in private rooms $2.50 a day and $1.00 in the general wards. Thirty contract physicians are employed by the Isthmian Commission, who report to Colonel Gorgas, Chief Medical Officer. One hundred and two trained nurses, 93 female, 9 male, trained in the United States, are on duty, with 138 attendants acting as orderlies. The Colon, Culebra, and Santo Tomas Hospitals, with the Leper Asylum at Palo Seco and the Tobago Sanitarium, have much less capacity, and require the services of a much smaller corps of officers and attendants. Attached to the daily trains on the Panama Railroad from Colon to Panama are hospital cars, arranged with berths which can be raised and lowered conveniently, forming comfortable stretchers and beds for the sick and injured who may be taken aboard at the different stations, and in this manner transported with a minimum degree of discomfort to the Ancon Hospital. In charge of these cars is a medical officer, with attendants, who gives attention to patients en route, and such medical services as may be needed. Four chaplains are assigned to duty in the hospitals, and two chapels, one Protestant and one Roman Catholic, supply places of worship. Seven buildings, at different points in the Zone, provided by the Isthmian Commission, are devoted to the work of the Young Men's Christian Association, containing reading, library, and amusement rooms.

The milk supply comes from the dairy, in which there are 93 cows, which were brought from the United States and were carefully tested for tuberculosis before being sent and after arrival on the Zone. Great care is given to the feeding, stabling, and milking

of the cows, and prompt measures taken in the treatment of any diseases which may occur. The milk is pasteurized. The poultry farm contains some six hundred chickens which are carefully watched for diseases. An autopsy is made of all dying from disease and the cause of death determined and recorded.

One of the most important sections of the Isthmian Canal Commission is the Laboratory of the Board of Health, forming a part of the department of sanitation, in charge of Samuel T. Darling, M.D., Chief of the Laboratory. Through the courtesy of Dr. Darling I was permitted to observe the methods of work carried on in the laboratory, which made my visit full of interest. The equipment of the laboratory is complete, the Government, through the Canal Commission, providing all that is necessary to conduct the important work of this department. The routine work in the laboratory includes examinations, pathological and bacteriological, for the hospitals, autopsies, surgical pathology studies, Wassermann reactions, blood cultures, vaccines, chemical analyses for the Commission and chemical examinations for the Ancon and other hospitals, of milk and foods (toxicological), special examinations of urine, etc., chemical, bacteriological, and microscopic examination of all Zone water supplies, including five reservoirs. The research work involves various subjects, reports upon which have been published by Dr. Darling. Possibly the most important is that entitled "Studies in Relation to Malaria," published by the Government Printing Office, Washington, 1910. Most elaborate experiments were conducted in determining some of the factors concerned in the prevention and transmission of malarial fever in the Canal Zone. Among the most interesting results obtained was the determination of the influence exerted by quinine upon the malarial parasite.

The recognition of the mosquitoes common to the Zone, their breeding habits, and the determination made of the species of

anopheles hospitable to malaria and those transmitting it claimed critical attention and study. Eleven species of anopheles were collected in the Canal Zone in the five years given to the study. It is interesting to note that observation determined the fact that the characteristic musical note of the mosquito is caused by the vibration of the proboscis and not by the wings, as commonly believed. The proboscis is therefore not only a weapon of offence, but an organ of harmony—an inharmonious combination.

In concluding this necessarily brief and incomplete recital of what sanitary science in this day has accomplished in the conservation of the health of the working community in the Canal Zone, many questions of far-reaching importance suggest themselves for consideration and for study. To one, as is the writer, familiar by actual contact in field and hospital with the appalling conditions which, through the absence of scientific knowledge, confronted the Medical Officer of the Army in the days of the Civil War, great must be his satisfaction in noting the changes which the last half century has wrought in the development and progress of scientific medicine.

In truth and in justice it can be said that in no department of medical effort has progress been more pronounced than in the medical corps of our public service, army, navy, and marine hospital service. The writer feels in this respect that he may be permitted to speak with a shadow of authority as it came to him in his earlier teaching days to place in the medical department of the public service about ninety of his private students. He knew of the conditions existing in those days and of the requirements exacted by the Boards of Examination guarding the gates of admission into the service, and with inspiring appreciation and gratifying pride he has watched the gradual but sure advancement in scientific knowledge and in adaptive methods which have taken place.

The war colleges of our army, the hospital ships of our navy,

the research laboratories of our marine hospital service, all speak in resounding tones of progress in scientific medicine, and place our public medical service in the very forefront of achievement among the nations of the world. No longer does the medical department of the different branches of the military and public service occupy the subordinate position assigned to them in the days of the Napoleonic campaigns, or even in those of more recent times.

In the earlier days the commanding general of the army concerned himself much, through his under-officers, about the state of efficiency of his commissary and quartermasters' departments, in order that he might without interruption continue his line of march to meet the enemy and engage him in battle. The medical department was, in a certain sense, an after-thought; the sick and wounded could be left behind in field hospital or in barracks, but the *impedimenta*, the quartermaster and commissary stores must be in as efficient state as possible. He did not know and his medical officers could not tell him at that time how important, absolutely necessary, it was that the medical officer should march side by side, as it were, with the soldier.

Under his care the soldier endures the fatigue of the march or comes to the battle line as an efficient agent in the conflict; between him and disease and pestilence the medical officer stands, without fear and with undaunted courage, erecting barriers of defence and battling, it may be with greater skill than the officer of the line, against the onslaught of the oft-times concealed enemy. In his hands the soldier becomes a unit of protection against all of the influences of his environment and the methods of his life—he is not only taught to protect himself, but to protect all about him. In a sense every act of his life, as every function of his physical being, becomes the intelligent care of the medical officer. Such, in truth, are the conditions in existence today under the

progressive methods which the advanced state of medical science confers.

It may be urged that it requires military discipline to achieve such results as we observe in the Canal Zone. Recognizing, as we all must, the influence exerted by a state of military control in conquering unsanitary conditions, and in obtaining unresisting compliance with those which are conducive, in all respects, to the conservation of health which may be permanently maintained, we find some examples of places presenting conditions similar to those which had existed in the Canal Zone, and which have been completely removed by civic efforts.

In a visit made in the last winter to South America, I landed in Santos, Brazil, a city of 41,000 population, and one of the best ports on the Atlantic Ocean. A few years ago this port was devastated by raging epidemics of yellow fever. To such extent did the disease prevail that vessels coming into the port lost in several instances, and very quickly, their entire crews from the disease, officers and men, before they could be unloaded. I was told of one instance in which a vessel lay anchored in the harbor for a period of eighteen months, unloaded, with cargo perishing in the hold.

Inspired by the fact that this city was the greatest shipping port of coffee in the world, the government and municipal authorities inaugurated a system of modern hygienic improvements which destroyed the breeding places of the stegomyia mosquito, and banished yellow fever, converting its beautiful harbor from a home of pestilence into an attractive seaside home, with the ships of many nations unloading and loading in guaranteed security alongside of its commodious and well arranged quays.

Such results had been obtained by civic effort, and they may be accomplished in other places where knowledge of sanitary science, combined with intelligent coöperation—freed from the

demoralizing and destroying grasp of the political boss, surcharged with graft—is employed in correcting unsanitary conditions, conducing, in this manner, to the prevention and to the staying of the ravages of disease.

The world should not, as we hope and believe it will not, look again upon a picture such as the Chickamauga Camp in the Spanish-American War, which portrayed in such lurid colors the humiliation of American medicine and as well the inefficiency of military control. While it is true we were on the eve of discoveries of great import, born of the experience which we gained in the occurrence and in the progress of the war, it may be said, without fear of successful contradiction, that the conditions which provoked such holocausts were in large measure preventable. It is true that we did not know of vaccination as a prophylactic measure against typhoid fever—a recent gift of laboratory research and of experimental medicine, which will take its place with vaccination against smallpox, as a monumental contribution to the promotion of the well-being and welfare of the human race—we did know, however, of the great necessity of microscopic, chemical, and bacteriological examinations of food and drink supplies. The bacillus of typhoid fever had been isolated in the year 1880, and we knew the importance of its destruction in the excreta. We knew of the necessity of maintaining all sinks and pits in rigid sanitary conditions, destroying by the free application of the most powerful disinfectants all microörganisms. Our knowledge, at the time, of the part taken by the common house fly in conveying disease germs was sufficient to provoke measures of protection against it, and the employment of agents to prevent fly breeding in all places favorable to such conditions. We had sat for two decades or more under the instruction of the great teacher who had taught us the far-reaching principles of *antisepsis*, and had demonstrated its practical application in all conditions

involving the sick and wounded—the subjects of the wounds of accident and of the wounds of intention. We knew the value of incineration in the disposal of all refuse matter. The gospel of Cleanliness, evolving *asepsis*, as the physician and the surgeon understand it, or should understand it, had been preached abroad in the land, enjoining all to be clean, through its unremitting application in practice.

All of these things and many more we did know, and yet the dread disease typhoid fever, stalked through the camp, apparently unrestrained, laying low one-sixth of the entire command—20,000 cases out of an army corps of 120,000 troops—with a case mortality of 7 per cent. The annals of civilized warfare do not present a page quite so black, recording conditions which the knowledge of the day should not have permitted to exist.

The progress of scientific medicine is onward, and today in the camps of our armies, on the battleships of our navy, and at the quarantine stations of our marine hospital service it shines with added luster, the medical officer taking his place, as of right it belongs to him, in the front rank with those whose efforts contribute to civil and military efficiency. Moved with pride by the achievements of his noble profession and inspired by loyal devotion to the corps of which he is a member, he bears aloft the banner of progress and scientific research, unfurled by that distinguished disciple of medicine and honored medical officer of the United States Army, William Beaumont, who nearly a century ago gave to the world and to scientific medicine, obtained through accurate research work in the living subject, the first knowledge it had of the functions of the stomach and of the constituent elements of the gastric juice and their action on foods. His name will live as the pioneer in scientific research in the history of American medicine.

Truly, may we not congratulate our professional brethren

who have so unselfishly devoted their talents and their lives to the service of their country upon the great work they have accomplished, which stirs our national pride, and proclaims to the world their monumental achievements, as the President and their Commander-in-Chief has so well proclaimed them, "Marvels of American courage, energy, and scientific thoroughness, skill, research, and original discovery." So long as preventable destroying diseases flee before the conquering hosts of efficient sanitation, so long will the labors of these noble benefactors of the human race be cherished. Upon their brows we place wreaths of victory, laurels won not in the fierce conflict of clashing arms, but in the home and in the daily walk in life, over which the Angel of Peace spreads her golden wings. As we acclaim them victors in peace, no less than in war, we enshrine them in the grateful hearts of their countrymen.

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